Online Appendix to "Jumping the Line, Charitably: Analysis and Remedy of Donor-Priority Rule"

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In this electronic companion, we provide additional robustness checks and technical details complementing the paper. In §§OA.1–OA.3, we provide the detailed analysis for §§8.1–8.3, respectively. In §OA.4, we discuss the case in which a continuum of risk types exists. In §OA.5, we complement §5.1 by examining a case in which $T_H = T_L$.

OA.1: Analysis for §8.1 (Candidate Autonomy)

Consistent with the rational queueing literature (see, e.g., Anand et al. 2011; Dai et al. 2017; Debo et al. 2008; Paç and Veeraraghavan 2015), we consider a case in which each category-k candidate adopts a mixed strategy such that the candidate accepts an organ offer from a type-i donor with probability of ξ_{ki} and declines it with the complementary probability. Endogenizing candidates' decision to accept or decline offered organs in the presence of multiple queues with different priority levels poses a significant analytical challenge. For tractability and ease of exposition, we make several simplifying assumptions. First, to reflect the priority of candidates with a higher level of medical urgency to decide whether to accept or decline offered organs, we assume category-1 candidates are prioritized to received organs from low-risk donors. Second, we focus on the case in which organs from low-risk donors are not enough for all category-1 candidates, which is consistent with the observation that high-quality organs are rarely offered to patients of a lower-ranking category. Clearly, a category-1 candidate, when offered an organ from a low-risk donor, should always accept the offered organ; that is, $\xi_{1L} = 1$. When offered an organ from a high-risk donor, however, the candidate may opt to decline the offer; that is, $\xi_{1H} \in (0,1)$; we define $\xi \triangleq \xi_{1H}$ for simplicity of notation. On the other hand, it is rational for category-2 candidates to accept all the organ offers because they are offered organs only from high-risk donors; that is, $\xi_{2H} = \xi_{2L} = 1$.

Before the introduction of the donor-priority rule, the threshold cost of donating in equilibrium is $C_i = 0, i = H, L$. We obtain the following equations:

$$\lambda_2 = \sum_{i\in\{L,H\}} \Theta_i p_2, \lambda_1 = (\lambda_2 - \mu_2)\frac{\tau_2}{\tau_2+\delta_2} + \sum_{i\in\{L,H\}} \Theta_i p_1 + [\lambda_1 - \Phi_L F(C_L)](1-\xi); \quad \text{(OA1)}$$

$$\mu_2 = \mu_1 - \lambda_1, \mu_1 = [\lambda_1 - \Phi_L F(C_L)](1-\xi) + \sum_{i\in\{L,H\}} \Phi_i F(C_i), \quad \text{(OA2)}$$

where the term $[\lambda_1 - \Phi_L F(C_L)](1-\xi)$ in (OA1) represents the arrival rate of the category-1 candidates who opt to decline organ offers from high-risk donors and stay on the wait list. The same term, in (OA2), can be interpreted as the arrival rate of organ offers those category-1 candidates decline.

An equilibrium requires that, when receiving an organ offer from a high-risk donor, each category-1 candidate must be indifferent between accepting the offer and declining it. The candidate's post-transplantation QALE is βT_H if accepting an organ from a high-risk donor. Otherwise, if the candidate declines the offer, following the asymptotic results (Zenios 1999), the probability that the candidate receives an organ from a low-risk donor is approximately $\frac{\Phi_L F(C_L)}{\lambda_1}$; the probability that the candidate receives an organ offer from a high-risk donor and accepts the offer is, approximately, $[1-\frac{\Phi_L F(C_L)}{\lambda_1}]\xi$; the candidate's pre-transplantation life expectancy while on the wait list is approximately $(1-\xi)[1-\frac{\Phi_L F(C_L)}{\lambda_1}]\cdot\frac{\alpha}{\delta_1}$. Hence, the equilibrium condition can be stated as follows:

$$\beta T_H = \left[1 - \frac{\Phi_L F(C_L)}{\lambda_1}\right]\xi\beta T_H + \frac{\Phi_L F(C_L)}{\lambda_1}\beta T_L + \left[1 - \frac{\Phi_L F(C_L)}{\lambda_1}\right](1-\xi)\frac{\alpha}{\delta_1}. \tag{OA3}$$

The above condition implies that in equilibrium, each category-1 candidate has an ex-ante expected utility equal to βT_H. In other words, all category-1 candidates become worse off in the presence of candidate autonomy, which allows them to choose whether to accept an organ offer or not to maximize their own expected utility. This consequence is attributed to the negative externality of category-1 candidates' declining of organ offers. While candidates decline organ offers from high-risk donors and wait for organ offers from low-risk donors, the category-1 wait list expands, reducing others' chances of receiving organ transplants. We characterize the equilibrium outcome in the following lemma:

Lemma OA1. *In the case with candidate autonomy, before the introduction of the donor-priority rule, in equilibrium, $C_i = 0, i = H, L$, and*

(i) each category-1 candidate chooses a probability $\xi \in (0,1)$ with which the candidate accepts an organ offer from a high-risk donor, which is determined by

$$\xi = 1 - \frac{\Phi_L F(C_L)\beta(T_L - T_H)}{[\lambda_1 - \Phi_L F(C_L)]\left(\beta T_H - \frac{\alpha}{\delta_1}\right)};$$

(ii) the arrival rates of candidates and organs are

$$\lambda_1 = \sum_{i\in\{L,H\}} \Theta_i p_1 + \frac{\tau_2}{\delta_2}\sum_{i\in\{L,H\}}[\Theta_i - \Phi_i F(C_i)] + \frac{\Phi_L F(C_L)\beta(T_L - T_H)}{\beta T_H - \frac{\alpha}{\delta_1}}, \text{ and}$$

$$\mu_2 = \sum_{i\in\{L,H\}} \Theta_i p_2 - \frac{\tau_2 + \delta_2}{\delta_2}\sum_{i\in\{L,H\}}[\Theta_i - \Phi_i F(C_i)].$$

Proof of Lemma OA1. From (OA3), we can obtain $\left[1-\frac{\Phi_L F(C_L)}{\lambda_1}\right](1-\xi)\,\beta T_H = \frac{\Phi_L F(C_L)}{\lambda_1}\beta\,(T_L-T_H)+\left[1-\frac{\Phi_L F(C_L)}{\lambda_1}\right](1-\xi)\,\alpha\frac{1}{\delta_1}$, which gives $\xi = 1-\frac{\Phi_L F(C_L)\beta(T_L-T_H)}{[\lambda_1-\Phi_L F(C_L)]\left(\beta T_H-\frac{\alpha}{\delta_1}\right)}$. Using the above equation as well as $\lambda_2=\sum_{i\in\{L,H\}}\Theta_i p_2$, $\mu_2=\mu_1-\lambda_1$, and (OA2) into (OA1), we can obtain

$$\lambda_1=\sum_{i\in\{L,H\}}\Theta_i p_1+\frac{\tau_2}{\delta_2}\sum_{i\in\{L,H\}}[\Theta_i-\Phi_i F(C_i)]+\frac{\Phi_L F(C_L)\beta\,(T_L-T_H)}{\beta T_H-\frac{\alpha}{\delta_1}}.$$

Plugging the above formula of λ_1 into (OA2), we can derive μ_1 as well as $\mu_2=\mu_1-\lambda_1$. *Q.E.D.*

Under the donor-priority rule, within the same category, those individuals who have registered to become organ donors have priority to receive an organ transplant. We denote by C_i^A type-i individual's threshold cost of donating in equilibrium.

Proposition OA1. *In the case with candidate autonomy, in equilibrium, the threshold costs of donating, C_H^A and C_L^A, satisfy*

$$C_i^A=\frac{\theta_i}{\theta_i+\sigma_i}\cdot(\beta T_H-\alpha/\delta_2)\cdot\frac{\sum_{i\in\{L,H\}}[\Theta_i-\Phi_i F\left(C_i^A\right)]}{\sum_{i\in\{L,H\}}\Theta_i[1-F(C_i^A)]}\ \textit{for}\ i=H,L.$$

Proof of Proposition OA1. Consider a type-i individual with the threshold cost $C_i^A, i=H,L$. Similar to § 5, we can obtain the formulas of λ_1 and μ_2 as in Lemma OA1. Compared with § 5, the only difference is that each category-1 candidate has an ex-ante expected utility of βT_H, and all organs for category-2 candidates are from high-risk donors. Hence, the net utility of a type-i individual with a cost c by registering and not registering to become an organ donor is $U_d^i(c)=\frac{1}{\theta_i+\sigma_i}+\frac{\theta_i}{\theta_i+\sigma_i}\beta T_H-c$, and $U_n^i=\frac{1}{\theta_i+\sigma_i}+\frac{\theta_i}{\theta_i+\sigma_i}\left\{\beta T_H-\frac{\sum_{j\in\{L,H\}}[\Theta_j-\Phi_j F(C_j^A)]}{\sum_{j\in\{L,H\}}\Theta_j[1-F(C_j^A)]}\,(\beta T_H-\alpha/\delta_2)\right\}$, respectively. In equilibrium, the individual is indifferent between joining the donor registry or not; that is, $U_d^i(c)=U_n^i$ for $i=H,L$, which can be rewritten as $C_i^A=\frac{\theta_i}{\theta_i+\sigma_i}\frac{\sum_{j\in\{L,H\}}\left[\Theta_j-\Phi_j F\left(C_j^*\right)\right]}{\sum_{j\in\{L,H\}}\Theta_j[1-F(C_j^*)]}\,(\beta T_H-\alpha/\delta_2)$ for $i=H,L$. *Q.E.D.*

The following corollary is immediate from Proposition OA1:

Corollary OA1. $\frac{C_H^A}{C_L^A}=\frac{\theta_H/(\theta_H+\sigma_H)}{\theta_L/(\theta_L+\sigma_L)}>1.$

Using the expressions of λ_1 and μ_2 and the threshold cost of donating $C_i, i=H,L$, we can now represent the social welfare as

$$W_s\,(C_L,C_H)=\sum_{i\in\{L,H\}}\left[\frac{1}{\theta_i+\sigma_i}\cdot\Lambda_i+\Theta_i\alpha/\delta_2+\Phi_i F(C_i)\,(\beta T_H-\alpha/\delta_2)-\Lambda_i\int_{-\infty}^{C_i}cf\,(c)\,dc\right],$$

where $C_i=0$ before the introduction of the donor-priority rule, and $C_i=C_i^A$ after the introduction of the donor-priority rule. In the above social-welfare characterization, for each risk-type $i\in\{L,H\}$, the second term $\Theta_i\alpha/\delta_2$ represents the aggregate pre-transplantation utility of individuals who become transplant candidates, the third term $\Phi_i F(C_i)\,(\beta T_H-\alpha/\delta_2)$ represents the marginal utility increase to those individuals due to organ transplants, and the last term $\Lambda_i \int_{-\infty}^{C_i} cf(c)\,dc$ represents the total cost of donating from type-i individuals. Compared to the case without candidate autonomy, the sole difference is that the social-welfare improvement due to organs donated by type L individuals is reduced to $\Phi_L F(C_L)(\beta T_H - \alpha/\delta_2)$ instead of $\Phi_L F(C_L)(\beta T_L - \alpha/\delta_2)$. The benefits of low-risk organs are systematically canceled out in equilibrium due to the equilibrium condition (OA3).

As suggested in Corollary OA1, the donor-priority rule still results in asymmetric incentives, so introducing the donor-priority rule can still reduce the social welfare.

OA.2: Analysis for §8.2 (Moral Hazard)

The value from undertaking this risky action $v \in (-\infty, \infty)$ is randomly distributed and has a probability density function of $g(\cdot)$. We assume this value v and the cost of donating c are independent. Before the introduction of the donor-priority rule, the decision to take risk and the decision to register to become donors are independent. In equilibrium, a unique cutoff value v_{np}^* exists such that only individuals with value higher than v_{np}^* choose to undertake the risky action and become type H.

Lemma OA2. *Before the introduction of the donor-priority rule, the equilibrium threshold cost of donating is $C_{np}^* = 0$, and the equilibrium cutoff value v_{np}^* is uniquely determined by*

$$v_{np}^* = \frac{1}{\theta_L + \sigma_L} - \frac{1}{\theta_H + \sigma_H} + \left(\frac{\theta_L}{\theta_L + \sigma_L} - \frac{\theta_H}{\theta_H + \sigma_H}\right)\left(\alpha/\delta_2 + \frac{\sum_{i=H,L} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i F(0)}{\sum_{i=H,L} \frac{\theta_i}{\theta_i + \sigma_i} \Lambda_i}(\beta T_a - \alpha/\delta_2)\right),$$

in which $\Lambda_L = G(v_{np}^*)\Lambda$, $\Lambda_H = \Lambda - \Lambda_L$, and $T_a = \frac{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i T_i}{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i}$.

Proof of Lemma OA2. Before the introduction of the donor-priority rule, donating produces no direct benefits, so the equilibrium threshold cost of donating is $C_{np}^* = 0$. Denote by v_{np}^* the equilibrium cutoff value. We have $\Lambda_L = G(v_{np}^*)\Lambda$, $\Lambda_H = \Lambda - \Lambda_L$, and $T_a = \frac{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i T_i}{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i}$. An individual with a cutoff value is indifferent between taking risk and not taking risk; that is, $v_{np}^* + \frac{1}{\theta_H + \sigma_H} + \frac{\theta_H}{\theta_H + \sigma_H}\left[\alpha/\delta_2 + \frac{\sum_{i=H,L} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i F(0)}{\sum_{i=H,L} \frac{\theta_i}{\theta_i + \sigma_i} \Lambda_i}(\beta T_a - \alpha/\delta_2)\right] = \frac{1}{\theta_L + \sigma_L} + \frac{\theta_L}{\theta_L + \sigma_L}\left[\alpha/\delta_2 + \frac{\sum_{i=H,L} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_i F(0)}{\sum_{i=H,L} \frac{\theta_i}{\theta_i + \sigma_i} \Lambda_i}(\beta T_a - \alpha/\delta_2)\right]$, which gives the representation of v_{np}^*. *Q.E.D.*

An individual chooses to become of high risk type if and only if the value from the risky action is high enough. We illustrate in Figure OA.1(a) the equilibrium before the introduction of the donor-priority rule.

After the introduction of the donor-priority rule, the risk-taking decision and the donating decision can be interdependent, because the benefits from the donor-priority rule depend on whether an individual undertakes the risk and becomes of high risk type or not. For ease of exposition, we define

$\Lambda_L = \Lambda \int_{-\infty}^{\infty} G\left(v_p^*(C)\right) f(C)\, dC$, $\Lambda_H = \Lambda - \Lambda_L$, $\Lambda_{L,d} = \Lambda G\left(C_L^M + \Delta\right) F\left(C_L^M\right), \Lambda_{L,nd} = \Lambda_L - \Lambda_{L,d}$, $\Lambda_{H,nd} = \Lambda\left(1 - F\left(C_H^M\right)\right)\left(1 - G\left(C_H^M + \Delta\right)\right), \Lambda_{H,d} = \Lambda_H - \Lambda_{H,nd}$, and $T_p^M = \frac{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_{i,d} T_i}{\sum_{i=L,H} \frac{\sigma_i \phi n}{\theta_i + \sigma_i} \Lambda_{i,d}}$.

Proposition OA2. *After the introduction of the donor-priority rule, the equilibrium threshold cost of donating is still* $C_p^*(v)$*, and the equilibrium cutoff value* $v_p^*(C)$ *is*

$$C_p^*(v) = \begin{cases} C_H^M & \text{if } v \geq C_H^M + \Delta \\ v - \Delta & \text{if } C_L + \Delta \leq v \leq C_H^M + \Delta \\ C_L^M & \text{if } v \leq C_L^M + \Delta \end{cases} \text{ and } v_p^*(C) = \begin{cases} C_H^M + \Delta & \text{if } C \geq C_H^M \\ C + \Delta & \text{if } C_L^M \leq C \leq C_H^M \\ C_L^M + \Delta & \text{if } C \leq C_L^M \end{cases},$$

where C_H^M, C_L^M, Δ *are jointly determined by*

$$C_i^M = \frac{\theta_i}{\theta_i + \sigma_i} \cdot \left(\beta T_p^M - \alpha/\delta_2\right) \cdot \frac{\sum_{i=L,H}\left(\frac{\theta_i}{\theta_i + \sigma_i}\Lambda_i - \frac{\sigma_i \phi n}{\theta_i + \sigma_i}\Lambda_{i,d}\right)}{\sum_{i=L,H} \frac{\theta_i}{\theta_i + \sigma_i}\Lambda_{i,nd}}, \text{ for } i = H, L, \tag{OA4}$$

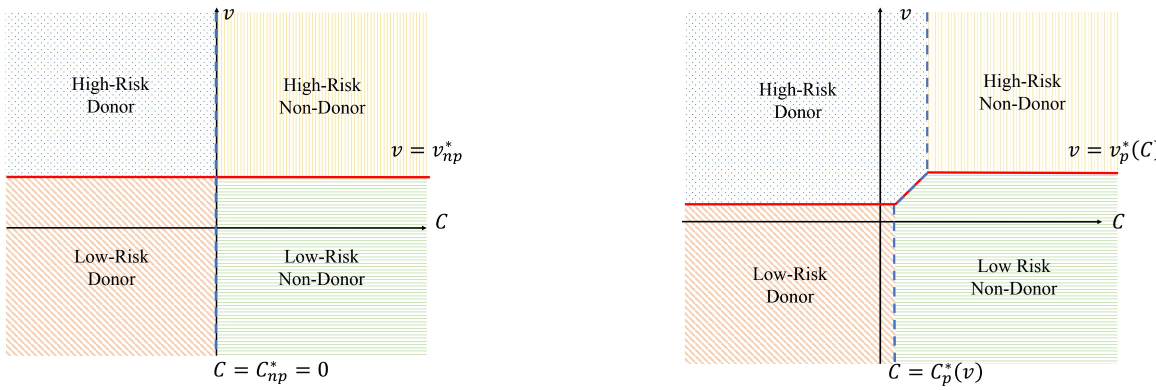
$$\Delta = \frac{1}{\theta_L + \sigma_L} - \frac{1}{\theta_H + \sigma_H} + \left(\frac{\theta_L}{\theta_L + \sigma_L} - \frac{\theta_H}{\theta_H + \sigma_H}\right)\beta T_p^M - C_L^M. \tag{OA5}$$

Proof of Proposition OA2. Denote by $\Lambda_i, \Lambda_{i,d}$, and $\Lambda_{i,nd}$ the equilibrium arrival rate of all type-i individuals, type-i donors, and type-i non-donors, respectively. After the introduction of the donor-priority rule, similar to the case in which the risk type is exogenous, given the risk-taking decision and thus the risk type i, the equilibrium threshold cost of donating is determined by

$$C_i^M = \frac{\theta_i}{\theta_i + \sigma_i} \cdot \left(\beta T_p^M - \alpha/\delta_2\right) \cdot \frac{\sum_{i=L,H}\left(\frac{\theta_i}{\theta_i + \sigma_i}\Lambda_i - \frac{\sigma_i \phi n}{\theta_i + \sigma_i}\Lambda_{i,d}\right)}{\sum_{i=L,H} \frac{\theta_i}{\theta_i + \sigma_i}\Lambda_{i,nd}},$$

for $i = H, L$. Similar to the result in Lemma OA2, given the donating decision, the equilibrium cutoff value is determined by $v_{p,d}^* = \frac{1}{\theta_L + \sigma_L} - \frac{1}{\theta_H + \sigma_H} + \left(\frac{\theta_L}{\theta_L + \sigma_L} - \frac{\theta_H}{\theta_H + \sigma_H}\right)\beta T_p^M$. Hence, individuals with $v \leq v_{p,d}^*$ and $C \leq C_L^M$ choose to sign up as donors and not to take risk. Denote by $\Delta = v_{p,d}^* - C_L^M$ the net cost from QALE by choosing to both take risk and sign up as donors (instead of neither of them). The expression suggests individuals with $v - C \geq \Delta$ prefer the combination of taking risk and signing up as donors to the combination of neither taking risk nor signing up as donors. Therefore, the equilibrium threshold cost of donating $C_p^*(v)$ and the equilibrium cutoff value $v_p^*(C)$ are determined accordingly as expressed in the proposition. *Q.E.D.*

In Proposition OA2, (OA4) reflects that those individuals who have become risk type i and have cost of donating C_i^M are indifferent between donating and not donating, and (OA5) reflects that those individuals with $v - C = \Delta$ and $C \in (C_L^M, C_H^M)$ are indifferent between both taking risk and registering to become a donor and choosing neither. The equilibrium population with donor priority is illustrated in Figure OA.1(b).



(a) equilibrium without donor-priority rule (b) equilibrium with donor-priority rule

Figure OA.1 Equilibrium with moral hazard

OA.3: Analysis for §8.3 (Dynamics in Decision to Register)

We now consider an extension in which an individual of type L can turn into type H over time. The transition time is exponentially distributed with a mean duration of $1/\tau$. Denote the probability of type-L and -H individuals becoming sick and in need of organ transplantation by $\hat{\theta}_L = \frac{\theta_L}{\theta_L+\sigma_L+\tau}$ and $\hat{\theta}_H = \frac{\theta_H}{\theta_H+\sigma_H}$, respectively. Intuitively, we assume $\hat{\theta}_L < \hat{\theta}_H$. Hence, the arrival rates of candidates and organs from different risk types are $\Theta_L = \hat{\theta}_L \Lambda_L$, $\Theta_H = \hat{\theta}_H \left(\Lambda_H + \frac{\tau}{\theta_L+\sigma_L+\tau}\Lambda_L\right)$, $\Phi_L = \frac{\sigma_L \phi n}{\theta_L+\sigma_L+\tau}\Lambda_L$, and $\Phi_H = \frac{\sigma_H \phi n}{\theta_H+\sigma_H}\left(\Lambda_H + \frac{\tau}{\theta_L+\sigma_L+\tau}\Lambda_L\right)$. Similarly, we can characterize the equilibrium in the following proposition.

Proposition OA3. *In equilibrium, the threshold costs of donating, C_H^* and C_L^*, satisfy*

$$C_i^* = \hat{\theta}_i \cdot (\beta T_p(C_H^*, C_L^*) - \alpha/\delta_2) \cdot \frac{\sum_{j\in\{L,H\}} \left[\Theta_j - \Phi_j F\left(C_j^*\right)\right]}{\sum_{j\in\{L,H\}} \Theta_j [1 - F(C_j^*)]} \text{ for } i = H, L,$$

and the above equilibrium exists and is unique.

Proof of Proposition OA3. The proof is similar to that of Proposition 3, except the probability of type-i individuals becoming sick and needing organ transplantation is now $\hat{\theta}_i$. *Q.E.D.*

OA.4: Continuous Risk Types

In the paper, for simplicity of analysis, we assume a discrete number of risk types. In this extension, we generalize our analysis to the case with a continuum of risk types, and show our key insights carry over. Each individual is characterized by a cost of donating, denoted by c, and a risk type $i \in \mathbf{I}$, with a larger i corresponding to a riskier type. In other words, in line with the discrete-type setting, we assume both θ_i and $\frac{\theta_i}{\theta_i+\sigma_i}$ are increasing in i, whereas T_i is decreasing in i. Similarly, we denote by Λ_i the measure of arrival rate of an individual being type i, and thus, the total arrival rate of healthy individuals is $\int_{i\in\mathbf{I}} \Lambda_i di = \Lambda$. We also use Θ_i and Φ_i to represent the measure of the arrival rate of transplant candidates who were type-i individuals and the measure of the arrival rate of organ supply from type-i individuals.

It is rather straightforward to confirm that after introducing the donor-priority rule, the threshold costs of donating are determined by

$$C_i^* = \frac{\theta_i}{\theta_i + \sigma_i} \cdot [\beta T_p^* - \alpha/\delta_2] \cdot \frac{\int_{j \in \mathbf{I}} [\Theta_j - \Phi_j F(C_j^*)]}{\int_{j \in \mathbf{I}} \Theta_j [1 - F(C_j^*)]}, \forall i \in \mathbf{I},$$

where $T_p^* = \frac{\int_{j \in \mathbf{I}} \Phi_j F(C_j^*) T_j}{\int_{j \in \mathbf{I}} \Phi_j F(C_j^*)}$ represents the average post-transplant life expectancy in equilibrium. It immediately follows with the following property:

$$\forall i, j \in \mathbf{I}, C_i^*/C_j^* = \frac{\theta_i/(\theta_i + \sigma_i)}{\theta_j/(\theta_j + \sigma_j)}.$$

This result implies the threshold cost of donating for individuals of the riskier type is higher, suggesting the donor-priority rule still provides stronger incentives for riskier types. As the asymmetric incentives still present, introducing the donor-priority rule can decrease social welfare in such a continuous modeling framework. The condition will be more complicated because it depends on the distribution of the types as well as how θ_i, σ_i, and T_i evolve with type $i \in \mathbf{I}$. When introducing the donor-priority rule decreases social welfare, enforcing a similar freezing-period remedy can help mitigate the asymmetric incentives and ensure social-welfare improvement.

OA.5: The Scenario of $T_H = T_L$.

Throughout the paper, we assume organ quality differs across risk types; that is, $T_H < T_L$. We now depart from this assumption, which allows us to isolate the effect of the heterogeneity of the probability of requiring organ transplants.

Remark OA1. Even when $T_H = T_L$, social welfare may still decrease after introducing the donor-priority rule. For example, when $\Lambda = 4$ million/year $\Lambda_H = 0.2\Lambda = 0.8$ million/year, $\Lambda_L = 0.8\Lambda = 3.2$ million/year, $\sigma_L = 0.01$, $\sigma_H = 0.1$, $\theta_L = 0.000014$, $\theta_H = 0.001046$, $T_H = T_L = 16.4$, $\phi = 0.05$, $n = 0.35$, $\beta = 0.75$, $\alpha = 0.5$, $1/\delta_2 = 5.83$, $c \sim N(0, 0.16)$, we have $C_H = 0.1104, C_L = 0.0149$, and the resultant social-welfare difference becomes $W_p^h - W_{np}^h = -\$25.33$ million/year after scaled by the economic value per quality-adjusted life-year to be $\$50,000$.

The numerical example in the above remark is rather surprising; it shows social welfare can decrease even if the asymmetric incentives do not reduce the average quality of the organ supply. To understand this result, note that when high-risk individuals are much more likely to need organ transplants, they respond to the donor-priority rule by registering even when their costs of donating are excessively high. Indeed, those high-risk individuals perceive the benefit of registering to become organ donors under the donor-priority rule without incorporating the negative externality on non-donors. Hence, their high costs of donating can outweigh the social welfare from additional registered organ donors. The decisions to donate by high-risk individuals with excessively high costs of donating are privately but not socially optimal under the donor-priority rule.

Remark OA1 highlights a commonly overlooked aspect in analyzing the social-welfare consequences of organ-donation policies: Certain individuals may be "pressured" into registering to become organ donors despite their excessively high costs of donating; as a result, more organ donation—even under the same organ quality—may not necessarily translate into higher social welfare.

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